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PRELIMINARY INVESTIGATION OF SKIMMING IN READING

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SUMMARY

This appears to be the first published experimental study of the process of skimming in reading. Six subjects, university students and instructors, read selected prose passages in different ways: silently at normal rate, silently at maximal rate, aloud at normal rate, aloud at maximal rate and by skimming (sometimes at their own rate, sometimes at a prescribed rate). The speed of reading was recorded by a stop-watch and in most experiments the efficiency of the reading was tested by demanding a reproduction, orally or in writing, of the passage read. Each subject also reported, especially after the skimming tests, how the skimming or reading was done and in what ways the skimming differed from the other modes of reading.

The chief conclusions are:

(1) There appear, even in this small group of college-trained persons, decided individual differences in speed and in efficiency of reading by all the methods, including skimming. One subject, for instance, skims three times as fast as another.

(2) The time per word, in hundredths of a second, is approximately this: normal aloud, 35; maximal aloud, 29; normal silent, 26; maximal silent, 22; skimming, 14.

(3) Knowledge that reproduction is to be demanded slows the rate of reading of all subjects by all methods.

(4) Speed of skimming increases in the later portions of texts several pages in length.

(5) The slowest reader is also the poorest reproducer.

(6) The best reproducer is a fast, though not the fastest, reproducer.

(7) The devices adopted in skimming are so different in different readers as to preclude summarizing.

(8) Skimming, itself, embraces at least five different varieties, or modes.

(9) When readers are forced to skim at a prescribed and unusually high rate, reproduction becomes very poor and the whole process becomes disagreeable and flurried.

[1] This investigation was carried on at the Educational Laboratory of Cornell University, from February to May, 1914. The general arrangement and supervision of the work was in the hands of Professor Whipple, now of the University of Illinois; the actual experimentation was in the hands of Dr. Curtis, now Assistant Psychologist at the Psychopathic Hospital, Boston. Acknowledgment is due to Mr. W. K. Layton, Assistant in Education, University of Illinois, for valued help in preparing the results for publication.

(10) Preferred rate in skimming is fairly closely correlated with natural rate in ordinary reading—the coefficient of correlation between normal silent and skimming speeds is +0.71.

(11) Subject matter lying outside the reader's general range of information would undoubtedly be skimmed only with difficulty and poorly, since in successful skimming much is supplied by the reader's previous information or his interpretation of the writer's intent as gathered from the context.

(12) It seems probable that practice in skimming might profitably be given in the public school.

Introduction

Although attention has been paid to the rate of reading and queries have been raised as to the possibility of developing more rapid rates in school children or of gaining speed by eliminating audition and getting meaning directly through vision, and although here and there there has been occasional mention of the shifts that occur in mental processes with very rapid reading, yet, so far as the writers know, this account is the first experimental study dealing primarily and directly with the subject of skimming.

The following citations are illustrative, though not exhaustive, of the literature to which we refer:

"Doubtless many of us dawdle along in our reading at a plodding pace which was set and hardened in days of listless poring over uninteresting tasks or in imitation of the slow reading aloud which was so usually going on either with ourselves or with others in the school." (Huey, *Psychology and Pedagogy of Reading*, pp. 179ff.)

"One of the great advantages of the shorter lines [as in newspapers] is that they constantly permit the reader to see in indirect vision what his eye has just passed as well as what is coming . . . a most desirable condition for all reading and especially for fast reading or for skimming." (Huey, *Op. cit.*, p. 411.)

"Any arrangement which makes comprehensive skimming an easy matter will be of great benefit for large parts of our reading." (Huey, *Op. cit.*, p. 423.)

In all these exercises [brief blackboard exposures of words to be acted out by children] the endeavor is to train the child to omit the auditory image, to develop speed in reading and to read for thought." (Klapper, *Teaching Children to Read*, p. 26.)

"The good reader takes all reading to be his province. Newspapers, periodicals, books, old and new, all present themselves to him in their proper perspective; they are all grist to his mill, but they do not go into the same hopper or require the same process. . . . Milton may be read in words or lines, Macaulay in sentences, Thackeray in paragraphs, and Conan Doyle in pages. . . . Skimming and rapid reading are different processes, but skimming is at times a good thing, too; even skipping becomes, on occasion, a sacred duty. . . . For skimming implies cream and skipping, a foothold somewhere." The clever reader finally learns to use his eye like a sixth sense, selecting the gist of the matter in whatever form it may appear. (Anonymous writer in the *Atlantic Monthly,* July, 1902.

"The principles laid down in this most suggestive article [the foregoing one in the *Atlantic Monthly*] are, however they appeal to common sense, relatively unrecognized in the teaching of reading. Teachers, when they thought at all of the importance of reading with different paces, have, it seems, either feared to meddle with anything so dangerous and novel or else they have thought that experience would bring ability to each reader. Unfortunately, it does not always do so, and many a man has wasted days and days in conscientiously going through a process that could have been variously modified with great profit to himself. . . . Training in place of reading and in silent reading are open fields that invite every earnest teacher who would make a real contribution to his pupils as well as to education in general." (Briggs and Coffman, *Reading in Public Schools,* p. 14.)

"When one reads a selection for the sake of the information it contains, he may want all the facts, or only the most important facts, or the argument or the trend of the thought; he may want certain facts or he may want simply to determine whether certain facts are there or not. Each of these distinct purposes requires that the selection be read in a way adapted to the end sought . . . No doubt many teachers, accustomed to insist on literal thoroughness, will see in such half-way reading and 'skimming' as is here advised the sure road to most careless and slovenly habits, which, even with all their 'thoroughness,' they are unable wholly to correct." (Spaulding, *Preventing and Correcting Defective Reading.*)

"A habit of slow reading may be fixed which retards the development of the normal speed. . . . *Some reading exercises should be given with a time limit*, but individual differences of ability should not be overlooked, and *hurried* reading should be avoided." (*The Teaching of Reading*, State of New Jersey, Department of Public Instruction, July, 1914, p. 14.)

Titchener says that his rate of reading varies considerably, both with the subject matter and with the purpose in reading. He would take a new book or article at a rush and then later go over it minutely and slowly if he wished the details. The headlong first reading is visual and diffusely organic in character; the reader pays little regard to headings or italics, taking in the first few words of a sentence and then jumping to catch-words, sometimes omitting entire sentences and even paragraphs. The organic reaction he believes to be widespread and strongly affective; he notes also a play of facial expression. The idea is emphasized that sight and "attitudinal feel" do the skimming, with occasional assistance from internal speech. (*Experimental Psychology of the Thought Processes.*

These citations indicate that, while several writers have urged the desirability of increasing the rate of reading for certain situations and while a few writers have even given thought to devices of instruction or of typography that would facilitate skimming, yet those who have direct charge of developing the reading habits of children are inclined to look doubtfully upon the idea of direct training in skimming.

These citations suggest the desirability of studying the process of skimming more carefully. Of course, not every one that reads does, or can skim, but we may surmise that in persons who read a great deal there is a tendency to skim, at least with certain kinds of material, and we may further surmise that this manner of reading may be further developed by training; possibly, indeed, it might be desirable to give regular practice in skimming to children in the upper grades of the schools after they have sufficiently mastered the mechanics of ordinary careful word-by-word reading.

Such were the considerations that led to our study. It was not found possible to narrow the field of investigation to the extent we might have wished, since, as our citations show, there was no precedent for choice of method or material; consequently, we had to grope our way along and our results can claim to be no more than tentative outcomes of a pioneering survey.

The Observers

The observers were *B*, Mr. Boring, an instructor in experimental psychology who was accustomed to skimming; *Fr*, Mr. Frazer, an assistant in educational psychology, who did not skim but read very fast, finding this more economical than to do the selecting necessary in skimming; *Gst*, Mr. Goldstone, an undergraduate who read very rapidly but did not skim and who had a slight speech defect (a lisp and a tendency to stutter); *Sk*, Mr. Skinner, a graduate working in psychology and educational psychology who read slowly and did not skim except when looking for some particular thing on a page; *D*, Miss Dimmick, an undergraduate who had done considerable work in psychology and educational psychology and who read very fast without skimming; and *Gou*, Miss Goudge, a graduate working in psychology and educational psychology, who said that the nature of the subject matter determined her method of reading.

Method of Experiments

Five kinds of reading were used: (1) reading silently at what the observer considered his normal rate; (2) reading silently at maximal rate; (3) reading aloud at normal rate; (4) reading aloud at maximal rate, and (5) skimming. The observer held the material in his own hands and started skimming or reading at a signal, saying "Finished," or "Done," when the assignment was completed. He was told beforehand how many pages there were in each article, that he would be required to reproduce, either orally or in writing, as much of the article as possible, and that after the reproduction he would be asked to give a detailed description of how he skimmed or read, especially as to differences between skimming and reading. By the use of a split-second stop-watch the time spent on each page and on the whole article was accurately recorded. The material used varied from one set of experiments to another, sometimes typewritten sheets, sometimes books on educational topics.

Preliminary Experiments

Preliminary experiments were performed both to ascertain what method and what material would probably be best for the main experiments and also to give the observers some practice. Typewritten sheets were used as the material; these were of equal length, and did not vary as to type, spacing, margins, paragraph-

ing, etc., but only in subject matter and style. Since the sheets contained almost exactly the same number of words, the rate of reading is recorded in the average number of seconds required to read the pages, and not—as in the later tables—in the average time spent on each word. The observers who took part in these preliminary experiments were *D*, *Fr*, *Gou*, *Gst*, and *Sk*.

TABLE I.

Average Time Taken for Reading Typewritten Sheets at the Various Rates

Observer	Silent				Aloud			
	Normal		Maximal		Normal		Maximal	
	Time	Rank	Time	Rank	Time	Rank	Time	Rank
D.....	72.5	2	68.3	4	81.9	1	77.2	3
Fr.....	78.5	3	50.3	2	86.0	3	64.0	1
Gou.....	89.6	4	74.0	5	84.6	2	75.0	2
Gst.....	51.9	1	47.6	1	91.4	4	84.4	4
Sk.....	93.5	5	67.3	3	92.1	5	85.6	5

TABLE 2

Percent of Typewritten Sheets Reproduced

Observer	Silent				Aloud			
	Normal		Maximal		Normal		Maximal	
	Percent.	Rank	Percent.	Rank	Percent.	Rank	Percent.	Rank
D...	36.73	3	29.70	2	27.52	5	24.17	3
Fr...	57.61	1	39.18	1	66.41	1	31.73	2
Gou.	42.28	2	21.85	3	29.81	3	23.26	4
Gst..	34.50	4	17.40	4	41.32	2	34.01	1
Sk...	18.00	5	15.35	5	27.98	4	17.86	5

From the tabulated results of the preliminary experiments (Tables 1 and 2), we find that *Gst* is a very rapid silent reader. He reports no kinaesthetic imagery at all and very little auditory imagery, so it is quite probable that he is a visual reader. *Fr* is evidently the best reproducer, and *Sk* the poorest. The others show considerable variation. In comparing Tables 1 and 2 we find that the slowest reader is the poorest reproducer, and that the best reproducer is above the average in speed of reading. Table 3 records the results secured when the material was read with the definite knowledge that it would not have to be reproduced. The significance of these figures, while not apparent here, will be evident later.

TABLE 3

Decrease in Time Required to Read a Sheet (on the Average) When Reproduction was Not Required

Observer	Silent		Aloud	
	Normal	Maximal	Normal	Maximal
D.....	10.7 (14.76%)	14.0 (20.50%)	2.2 (2.69%)	1.1 (1.43%)
Fr.....	19.1 (24.33%)	8.1 (16.10%)	7.6 (8.84%)	7.5 (11.72%)
Gou.....	31.0 (34.60%)	26.1 (35.27%)	5.3 (6.26%)	15.4 (20.50%)
Gst.....	00.4 (0.77%)	04.7 (9.87%)	11.0 (12.04%)	7.9 (9.36%)
Sk.....	30.7 (32.83%)	3.5 (5.20%)	2.0 (2.2 %)	5.1 (5.96%)

In the second part of the preliminary experiments the typewritten sheets were abandoned because of the relative illegibility of the print, the evident advantage in skimming of having the material divided properly into paragraphs, and the difficulty of providing enough sheets for the entire experiment. Selections from the *Bulletins* of the United States Bureau of Education were used instead. In any one bulletin three selections were read: one normal silent, one maximal aloud, and the third skimmed in roughly one-half or one-third the time which the observer would probably have taken to read the selection at normal silent speed. Reproductions were taken as before. The results of this work will be found in Tables 4 and 5.

TABLE 4

Average Time per Word and Average Per Cent. of Material Reproduced from the Bulletins
(Figures are enclosed in parentheses when the number of cases is too small to ensure accurate results.)

	Normal Silent		Maximal Aloud		Skimming (½ Normal)		Skimming (⅓ Normal)	
	Time	Percent.	Time	Percent.	Time	Percent.	Time	Percent
D.....	.27	80	.25	63	.11	28	.08	35
Fr....	.22	88	.20	90	.11	45	.08	60
Gou...	.24	58	.22	50	(11)	10	.08	30
Gst...	.12	(53)	.24	(42)	.06	5	.04	30
Sk....	.33	57	.28	53	.15	25	.10	30

TABLE 5

Observers Arrangec in Order of Speed of Reading and of Excellence of Reproduction from the Bulletins

Normal Silent		Maximal Aloud		Skimming (½ Normal)		Skimming (⅓ Normal)	
Time	Percent.	Time	Percent.	Time	Percent.	Time	Percent.
Gst	Fr	Fr	Fr	Gst	Fr	Gst	Fr
Fr	D	Gou	D	D	D	Fr	D
Gou	Gou	Gst	Sk	Fr	S	Gou	Gst
D	Sk	Gst	Gou	(Gou	Gou	D	Gou
Sk	Gst	Sk	(Gst)	Sk	Gst	Sk	Sk

From these tables we may conclude that *Fr* is the best reproducer, *D* the next best, and that *Sk* is the lowest reader. Here the results for *Fr* and *Sk* agree with those obtained from the earlier experiments.

The chief features of the reports about what happened in skimming are as follows: *D* reported that she read the topic sentence[2] carefully and then followed down the sides of the paragraph, catching an important word occasionally and then following the sentence until the verb was reached. *Fr* attempted to

[2] The observers in these experiments meant by the "topic sentence,"—the one which contained the gist of the paragraph,—most often the first sentence in the paragraph.

force the pace by reading vertically, but found it could not be done, and finally hit upon the method of noting necessary "beads," *i. e.*, important words, which occur at fairly regular distances apart (?); he says skimming is successful and easy if one can fit one's jumps of attention to this distance between important words. *Gou* read the topic sentences, and then, keeping these in mind, skimmed down the center of the page for new ideas of importance. She usually read some or all of the concluding sentences of paragraphs. *Gst* skipped from topic to topic, keeping the leading ones in mind, omitting the middle portions of sentences, and emphasizing nouns. *Sk* took note of the main words, that is, the more general ones, supplying the others. These reports will be generalized later, when the results of the main experiments are discussed.

Main Experiments

In the main experiments Mangold's *Child Problems* was used as the material for reading; since its subject matter was about equally familiar to all the observers, its text is divided into sections of approximately equal length, and it was long enough to afford a good deal of material. The observers in this part of the investigation were *B*, *D*, *Fr*, *Gou*, *Gst*, and *Sk*. The method used was the same as in the previous work, except that after three selections (about two pages each) had been skimmed at a rate chosen by the subject, one selection was read at some other speed, as, for example, maximal silent. In all, twelve selections were skimmed. The results from these experiments are recorded in Tables 6, 7, and 8.

From the arithmetical results we may draw the following conclusions:

(1) The twelve passages appear to have been about equal in difficulty, since no one of them is found to stand uniformly high or low in the speed with which it was skimmed by the six readers (Table 6.)

(2) The speed of reading under these conditions is such that on the average 5.9 words are *covered* (not read, of course) per second, or one word each 0.169 sec. (Table 7.)

(3) Under instructions to skim there remain marked individual differences in the rate; thus, to cite extremes, *Gst* skims at nearly three times the pace of *Gou*; again, we note that *Fr* can read

TABLE 6

Twelve Passages Arranged in Order of Speed for Each Reader

B	D	Fr	Gou	Gst	Sk
7	10	4	6	4	5
8	3	5	3	2	1
4	7	7	1	6	4
12	8	10	5	1	8
6	9	1	8	5	11
10	1	9	9	9	7
2	11	12	4	10	10
11	12	2	7	12	9
9	2	6	12	7	12
3	4	11	10	11	6
5	6	3	11	3	2
1	5	8	2	8	3

TABLE 7

Average Time per Word in Skimming 12 Passages (in Sec.)

Reader	12 1st pages	12 2d pages	8 3d pages	General Aver.
B.....	.211	.154	.135	.171
D.....	.176	.150	.166	.164
Fr.....	.155	.157	.164	.158
Gou.....	.247	.233	.194	.228
Gst.....	.107	.097	.085	.097
Sk.....	.257	.210	.177	.199
Aver....	.192	.167	.153	.169

TABLE 8

Average Per Cent. of Reproduction for Each Selection Skimmed

	1	2	3	4	5	6	7	8	9	10	11	12	Av.
B.....	50	50	50	60	60	60	80	75	75	50	50	50	59
D.....	70	60	50	50	60	60	60	50	80	30	30	40	53
Fr.....	60	80	70	80	85	70	75	80	85	85	80	80	78
Gou.....	85	90	75	75	60	75	70	60	70	40	60	80	70
Gst.....	75	60	70	60	50	50	70	60	50	60	30	60	58
Sk.....	80	60	25	60	40	60	70	40	60	20	50	30	50

aloud (Table 4) faster than *Gou* skims silently in these passages (Table 7). In fact, it appears htat *Gou* really does not succeed in achieving any noticeable increase of speed when directed to skim (her rate per word in normal silent reading is 0.24 sec. per word; in maximal speed aloud, 0.22 sec.; in skimming 0.228 sec.)

(4) By comparing the speed of skimming by pages, we find that it runs approximately 0.19 sec. per word for the first page, 0.17 sec. per word for the second page and 0.15 sec. per word in the third page (of the 8 passages that ran over two pages in length).[3] The explanationis presumably in part general "warming up" to mental work, in part increase of ease of "skipping" in the later portions of the selections as the context "piled up" and supplied more and more material for guiding the reader.

[3] The data from which these figures are derived are not shown in detail in any of our tables.

The following conclusions may be drawn from the statements of the observers as to their methods of skimming:

(1) All the observers, with the possible exception of *Fr*, read the greater part of the *first sentence*, "to get the 'run' of the thing."

(2) After this, skipping began, and now greater *individual variations* were found. *B* usually stopped in sentences after reading about half, or enough to determine whether the thought had been changed, and jumped practically all quotations. *D* read the first sentence, and then passed down the page, selecting words that seemed important, hesitating long enough to get their meaning in the sentence. She pronounced to herself only the important words. *Fr* read vertically, finding that two words usually gave the meaning of a line, took fairly large jumps, and noted a tendency to stop and read "slogans" and "catch-words." *Gou* believed that her eye movement was faster than in ordinary reading. She skipped usually just after getting a new and important point, moving the eye vertically at these times, trying to select anything important enough to be read, in part or entire. *Gst* skipped no entire sentences, but in reading the last thought of a sentence attempted to catch the opening phrase of the next, and then omitted it if it was not the thought wanted. He filled in a great deal from previous experience. *Sk* read "mostly the high places," attempting to read the outline of the selection and infer the remainder. Frequently, after glancing at the first few words of a phrase or sentence, he could judge whether or not to go on. In jumping from a sentence to several below, he found no particular criterion by which to determine where to begin again, sometimes starting in at a new paragraph and again at some particular word or phrase that he happened to see. In general, he read the first sentence of a selection and then enough of the succeeding sentences to find out whether or not they were essential or were merely elaborations or "filling-in" of the previous thought. If they were essential, enough was read to give the thought, and if not, a jump was made to the next sentence or phrase, and it received similar treatment.

(3) The observers differed in their treatment of the *last sentences* of a paragraph; *D* always read them, *Gst* never unless forced; the others sometimes read them and sometimes did not.

(4) The observers differed also in the discrimination used in *rejecting certain parts of the material.* *B* reported that he skipped

sentences referring to particular instances of laws, that is, those containing names of states, phrases whose sense was markedly supplementary, and quotations. He regarded quotations as "padding." *D* skipped sentences beginning with small words, or where there seemed to be no important words. *Fr* tried to skip minor details, but reported that he was really "too conscientious to be a good skimmer" and feared lest he might omit something important. *Gou*, after a new "important point," moved down the page until she found another important point. *Gst* skipped what seemed to be "filling-in" and details that were known. *Sk* skipped parts "not essential to the gist"—whenever he thought he could reason or infer the meaning without reading. Evidently, *B* used more logical discrimination in his skipping than did the other observers.

(5) The influence of *punctuation* was mentioned by *B*, *D*, and *Fr; B* reported that it was taken "on the jump," not exactly the mere marks, but the general spacing of the sentence. He found that the exclamation mark had tremendous attention-compelling power. *D* thought punctuation gave hints as to the importance of the material; she had a tendency to read material set off by quotation marks. *Fr* found the attraction of capitals and quotation marks so strong that he jumped directly to them. *Gst* said that punctuation marks did not exist for him, but he gave preference to short sentences, so probably he was affected by the spacing, at least. *Sk* mentioned capitals and italics. In general, there seemed to be a rather definite tendency for all observers to attend to proper nouns, italics,[4] and quotation marks.

(6) There was a considerable amount of individual variation as to the *kinds of material* easy to skim, and difficult to skim. *B* could skim easily what was well-paragraphed, *D* what was tabulated, *Fr* if the "pitch"[5] was fairly wide and successfully estimated near the beginning; *Gst* found it hard to skim what was interesting, while *Sk* found this easy.

From the preliminary experiments it was evident that condensed material is very hard—almost impossible—to skim; and that when the material is divided into paragraphs, it is easier to skim than if it is all in one paragraph. From the results of

[4] Our observers differ from Titchener evidently in this and other respects.

[5] "Pitch" apparently meant the amount of the skip or jump to be made, the distance from one essential idea to the next one.

some of the auxiliary work, it was evident that skimming was easier in material in which the first sentence of each paragraph was the topic sentence.

(7) There was a *tendency to glance back* at catch-phrases, italicized words, etc., or perhaps merely at the form or length of the paragraphs, to summarize the impressions gained. Doubtless the knowledge that a reproduction of the passage was to be demanded prompted this hasty retrospective glance. This tendency was shown particularly by *B*, *D*, *Gou*, and *Gst*.

(8) Certain notes made by the experimenter show differences in the forms of the reproductions. Thus *B* gave a logical paraphrase; *Fr* gave details and all in proper order; *Gou* gave her reproduction slowly but with evidence of the "logical schemas" which she was accustomed to make during the skimming; *Gst* often reproduced first the material which he had read last. *Fr* is a lip-reader and sometimes whispers the words.

(9) There are apparently different modes of rapid reading and skimming: (a) fast reading, in which every word is read, usually in kinaesthetic or auditory-kinaesthetic terms; (b) "trailing," which is "perceiving without apperceiving," catching impressions which may or may not be meaningful for the context—probably not in most cases; (c) "covering," like trailing, except that it may be either up and down or right and left, while trailing is the latter; (d) *omitting logically*, the procedure used when the first few words of a sentence are read and the observer decides it is unimportant and omits the rest; (e) *omitting arbitrarily*, as *Fr* did. (This observer, when starting a new selection, arbitrarily chose a size of "jump" which he thought fitted the material, and then took jumps of this size throughout, reading only those words which happened to come at the end of a jump.) Of the methods mentioned, *B* used (b) and (d), *D* (b) or (c), and (d), *Fr* (e), *Gou* (b)?, (c)?, (d), *Gst* (b) and (d), and *Sk* (b) and (d).

Auxiliary Experiment 1

(Extra Fast Skimming)

From the results of the main experiments it was evident that the observers differed greatly in the speed of skimming (see Tables 4 and 7), and it therefore seemed advisable to discover, if possible, what would be the *effect of diminishing the time* allowed for the skimming, by forcing each observer to skim faster than he would naturally.

The observers who took part in this work were *D*, *Fr*, *Gou*, *Gst*, and *Sk*. The material was four educational reprints which contained, respectively, 3476, 1764, 1650, and 3360 words. Three minutes were allowed for skimming the first (the observer was warned at the expiration of each quarter of the time); one minute for the second; one minute for the third, and one minute and a half for the fourth. The rate of skimming was .05 per word for the first, .03 for the second, .04 for the third, and .03 for the fourth reprint.[6]

The following conclusions may be drawn from this experiment:

(1) Reproduction falls off when the observer is forced to read at these high speeds. *Gou* and *Fr* tried to get only the main points and skip the rest, while the other observers tried to trail over the whole thing and lost everything.

(2) In general, the first sentence of a paragraph is more likely to be read than the rest; italics are likely to be read, and fine print, such as that used for foot-notes, is almost sure to be omitted.

(3) The main points in the reports of the observers are as follows: *D* failed to get connected ideas, took larger jumps and read largely by italicized words and phrases rather than sentences —"did not like skimming so fast"; *Fr* read italics and quotations and guessed at the content of the paragraphs (a few supplementary experiments revealing that *Fr*, when instructed to skim as fast as possible, seemed to give up his system of arbitrary jumps and skim as the others did); *Gou* could not work out logical schemas as she did before, and could reproduce only the first sentence of paragraphs; *Gst* notices slight emotional disturbances, and found it hard to keep the logical sequence of ideas, and was able to reproduce practically nothing from the fastest passages; *Sk* got no sense out of the articles and noted only the first sentences of paragraphs or those which stood out because of quotation or question marks.

Auxiliary Experiment 2

(Long Passages)

An additional experiment was carried out to see what would be the *effect of length of passage* on the rate of skimming. For this were used six educational reprints, varying in length from 2805

[6] These rates may be compared with those for normal silent reading (roughly .20 to .30) and for the previous skimming (roughly .08 to .17).

to 6624 words. All observers except *B* took part. The method was the same as that used on the main experiments. The results given in Table 9 show that the rate of skimming quickened with the lengthening of the article to be skimmed. It should be noted, however, that this increase in speed may be almost entirely

TABLE 9

Average Speed of Skimming, in Sec. per Word, for Articles of Varying Length

(Articles A and B contained 3000 words, C 4000; D and E 5000; and F 6600, approximately.)

	A	B	C	D	E	F
D	.10	.16	.09	.09	.11	.05
Fr	.07	.08	.07	.05	.08	.07
Gou	.12	.17	.10	.12	.18	.14
Gst	.06	.09	.06	.05	.07	.05
Sk	.08	.20	.11	.06	.07	.06
Av.	.12		.09	.09		.07

brought about by the observer's decision that he has already "taken in" all he can hold for the coming reproduction and that he will attempt to read nothing but the most important points on the later pages. *D*, losing interest toward the end of the passages, skipped a great deal there and felt that, in general, she skimmed in the same manner as in the shorter passages; *Fr* took longer steps; *Gou* thought she skipped more in skimming a long than a short article; *Gst*, when told in advance that the article was long, tended to hurry his skimming; *Sk* read less carefully in the longer selections and omitted much more of the material.

Auxiliary Experiment 3

(Rates of Reading)

A last set of tests was carried out to determine more precisely than the conditions in the other experiments had permitted, the relations between the rates of reading by the five different methods. Here the material used was educational reprints.[7] The observers were *D*, *Fr*, *Gou*, *Gst*, and *Sk*. The method was as follows: each reprint was divided in halves; the first half was then read by one of the five methods, the time recorded, etc.; then the second half was read by another of the methods. In

[7] The following may be cited as examples of reprints used in this work: Kirkpatrick, "Child Study," *Pop. Sci. Mo.*, 1910; Ayres, "Psychological Tests in Vocational Guidance," this JOURNAL, 1913; Bagley, "Elective Studies in the High-School Curriculum," *Sch. Rev.*, 1908; Bingham, "The Use of Experiment in Teaching Educational Psychology," this JOURNAL, 1910.

all, 8 passages were read by each method; the same passage was never re-read. This general arrangement was designed to cancel out the effects of possible unevenness of the material.

TABLE 10

Average Time, in Seconds per Word, for Selections Read by the Five Methods

	Silent				Aloud					
	Normal		Maximal		Normal		Maximal		Skimming	
	Time	Rank	Time	Rank	Time	Rank	Time	Rank	Time	Rank
D.....	.28	3	.25	3.5	.33	3	.27	2.5	.15	4
Fr.....	.19	2	.16	2	.27	1	.24	1	.12	2
Gou...	.32	4	.25	3.5	.40	4	.28	4	.17	5
Gst....	.13	1	.11	1	.32	2	.27	2.5	.08	1
Sk.....	.37	5	.32	5	.43	5	.37	5	.14	3
Av....26			.22		.35		.29		.13	

TABLE 11

Average Reproduction (on Scale of 100) for the Five Methods

	Silent				Aloud					
	Normal		Maximal		Normal		Maximal		Skimming	
	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
D.....	76	3.5	72	3	75	3	76	4	73	3.5
Fr.....	89	1	89	1	98	1	85	1	81	2
Gou.....	84	2	84	2	81	2	83	3	86	1
Gst.....	76	3.5	71	4	74	4	84	2	73	3.5
Sk.....	65	5	60	5	51	5	58	5	50	5
Av.....	78		75		74		73		73	

Tables 10 to 12 show the results obtained. From them the following conclusions may be drawn:

(1) *Gst* is the fastest and *Fr* the next fastest silent reader; the same two observers are the fastest in reading aloud, both at normal and at maximal rates. *Sk* is slowest in all these modes of reading. As in the earlier tests *Gou* speeds up less in skimming than do the others.

(2) *Correlations for the speed of reading by the five methods* (calculated by the Pearson method) are as follows:

	r	P.E.
Normal silent and maximal silent.....	.70	.16
Normal silent and normal aloud.....	.66	.17
Normal silent and maximal aloud.....	.42	.25
Normal silent and skimming.....	.71	.16
Maximal silent and normal aloud.....	.63	.19
Maximal silent and maximal aloud.....	.65	.18
Maximal silent and skimming.....	.61	.19
Normal aloud and maximal aloud.....	.62	.19
Normal aloud and skimming.....	.41	.25
Maximal aloud and skimming.....	.28	.28

We find that there is greatest correlation between skimming-rate and rate for normal silent reading. Only the correlations which are several times the probable error should be considered significant.

(3) From the average time for all the observers we find that *the order of speed for the five methods* is: skimming, maximal silent, normal silent, maximal aloud, normal aloud. The only exceptions to this are *Gou* and *Sk*, both of whom average faster at maximal aloud than at normal silent. If we take the time for normal aloud, the slowest speed, as 100, then maximal aloud would be 83, normal silent 74, maximal silent 60, and skimming 40. If we take normal silent as 100, then normal aloud would be 135, maximal aloud 112, maximal silent 81, and skimming 54.

(4) *Fr* and *Gou* are the best reproducers, and *Sk* the poorest. In comparing (1) and (4) we find that one of the fastest readers is one of the best reproducers, and that the slowest reader is the poorest reproducer, which is what we should have expected in consideration of the results obtained by Abell (*Educational Review*, 8, 1894: 283), Dearborn (*Psychology of Reading*), Huey (*Psychology and Pedagogy of Reading*), and Quantz (*Problems in the Psychology of Reading*). There are, however, two exceptions to this general rule, *Gou* and *Gst*, for *Gou* is one of the best reproducers and one of the slowest readers, while *Gst* is a very fast reader and not a particularly good reproducer.[8]

(5) From the average reproduction, we find that the *reproduction* is likely to be better for normal silent than for any other speeds. (Exceptions: *Gou* best for skimming; *Gst* best for maximal aloud.)

(6) From the mean variations (Table 12) there is least *variation* in the speed of normal aloud, and most for skimming.

(7) The mean variations for the different observers show that in general, *Fr* and *Gst* were most, and *D* and *Gou* least variable.

(8) From inspection of the average time taken to read the various selections and of the mean variations for each speed, we may conclude that the *material was fairly uniform in eifficulty.*

[8] There seems to be an explanation of this paradox. It will be remembered that *Gou* proved to be greatly affected in speed by the necessity of reproducing at the end. It therefore seems probable that, either voluntarily or involuntarily, she slowed down her speed in order to make a better reproduction at the end, while the other observers did not do this. If *Gou* had worked under exactly the same conditions as the others, there might have been a change in her position as a reproducer, in which case the position of *Gst* would have been moved up and the results would have been more nearly what we should have expected.

TABLE 12

Per Cent. Mean Variation for the Various Observers in Time per Word for the Five Methods

	Silent				Aloud					
	Normal		Maximal		Normal		Maximal		Skimming	
	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
D.....	14.29	4	8.00	5	6.06	5	11.11	2.5	20.00	2
Fr.....	21.05	1	12.50	2.5	14.07	1	12.50	1	16.67	3
Gou.....	18.75	2	12.00	4	10.00	3	7.14	5	11.76	5
Gst.....	15.38	3	18.18	1	12.50	2	11.11	2.5	12.50	4
Sk.....	13.51	5	12.50	2.5	6.98	4	10.81	4	22.22	1
Av.....	13.60		12.64		9.92		10.53		16.63	

Conclusion

The principal factual conclusions of our experimentation have already been presented in the summary that precedes the article. It remains only to remind the reader that our study has been limited to a small group of adult readers, all college-trained and all somewhat familiar with the subject matter read. However, without risking generalization we can at least say that our study has indicated methods that may be employed and probably fore-shadowed some of the general outcomes that may be expected in a more comprehensive survey of the problem. We would suggest that a fruitful extension of the present investigation would be the application of similar methods to a group of children of perhaps different pedagogical and different mental levels, with special reference to the effect of practice and to the limitations placed upon skimming by degree of general intelligence and range of information, or special familiarity with the subject matter employed.

In the absence of evidence to the contrary we are disposed to think that systematic drill in skimming is desirable for children that have mastered the mechanics of reading and that are using reading regularly as a tool for the acquisition of knowledge.